IMPORTANT: Read before using

First steps
(UCCNC)

Desktop CNC / 3D system
STEPCRAFT 2 – 210/300/420/600/840

Call for consumer information

Customers from outside the U.S.

STEPCRAFT GmbH & Co. KG
Kalkofen 6
58638 Iserlohn
Germany
Phone: 0049-2371-9748574
Email: info@stepcraft-systems.com

Customers from the U.S. / Canada

STEPCRAFT Inc.
733 E Main St. Unit 3
Torrington, CT, 06790
United States
Phone 001-203-5561856
Email info@stepcraft.us

Original instructions

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NOTICE

All instructions, warranties and other collateral documents are subject to change at the sole discretion of STEPCRAFT, Inc. For up-to date product literature, visit *www.stepcraft-systems.com* for customers from Europe or *www.stepcraft.us* for customers from US / Canada and click on the service & support tab for this product.

Meaning of special language

The following terms are used throughout the product literature to indicate various levels of potential harm when operating this product: The purpose of safety symbols is to attract your attention to possible dangers. The safety symbols, and their explanations, deserve your careful attention and understanding. The safety warnings themselves do not eliminate any danger. The instructions or warnings they give are not substitutes for proper accident prevention measures.

NOTICE	Procedures, which if not properly followed, create a possibility of physical property damage AND a little or no possibility of injury.
CAUTION	Procedures, which if not properly followed, create a probability of physical property damage AND a possibility of serious injury.
WARNING	Procedures, which if not properly followed, create a probability of property damage, collateral damage, serious injury or death OR create a high probability of superficial injury.
	Safety alert: Indicates caution or warning. Attention is required in order to avoid serious personal injury.

⚠WARNING Read the ENTIRE instruction manual in order to become familiar with the features of the product and how to operate them. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury, electric shock and/or fire.

This is a sophisticated hobby and semi-professional product for advanced craftsmen with previous experience in the operation of tools such as electric drills, routers and computerized tools like CNC routers or 3D printers. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in personal injury or damage to the product or other property. This product is not intended for use by children without direct adult supervision. Do not attempt disassembly, use with incompatible components or augment product in any way without the approval of STEPCRAFT GmbH & Co. KG or STEPCRAFT, Inc. This manual contains instructions for safety, operation and maintenance. It is essential to read and follow all the instructions and warnings in the manual, prior to assembly, setup or use, in order to operate correctly and avoid damage or serious injury.

Age recommendation: For advanced handcrafters ages 14 and above. This is not a toy.

SAVE ALL WARNINGS AND INSTRUCTIONS FOR FUTURE REFERENCE.

Should you encounter any doubts or require any further information, please do not hesitate to contact us before commissioning of the system and/or the spindle. Our contact details can be found on the front page of this manual.

The term “spindle” in the warnings refers to your mains-operated (corded) power supply and the spindle itself. This could be a third-party product or the STEPCRAFT high frequency spindle.

The term “machine” or “system” in the warnings refers to your mains-operated (corded) power supply and the STEPCRAFT CNC /3D desktop system itself.

General safety precautions and warnings

This tool is controlled by a computer. Within operation it cannot be directly controlled. Missing caution or program errors can cause unexpected movement.

- Always ensure you fully understand the control program on your computer and how it affects the movement of the tool.
- Always operate your tool indoors on a solid horizontal table or workbench.
- Always carefully follow the manufacturer directions and warnings for any related equipment (i.e. milling spindles, 3D print heads, drag knifes, etc.).
- Always keep the product, related tools, small parts and electrical components out of the reach of children.
- Always keep children well out of the vicinity of this product.
- Always keep hair secured above your shoulders so it cannot get caught in the linear guides or the rotating tools.

Continued on next page

- Always avoid water exposure to all equipment not specifically designed and protected for the purpose. Moisture causes damage to electronics.
- Never maintain and operate this product at poor light settings.
- Always ensure all clamping accessories for insertion tool, machine guided tool and work-piece are secure before usage.
- Always store product in a dry, temperate and secure location.
- Do not touch the insertion tools or motors as they can become extremely hot during use.
- Do not operate this tool outside.
- Always ensure the emergency switch is properly set before operating.
- Always ensure you understand the product and how to operate it.
- Only use STEPCRAFT-approved replacement parts and accessories for this product.
- Never place any portion of the tool or the related accessories in your mouth as it could cause serious injury.
- Never operate your desktop 3D system with a computer operated on battery.
- Never connect the tool unless using or testing the tool. Do not perform maintenance with the power supply installed.
- Never operate this product if you are tired, ill, taking any medications that impair judgment or are under the influence of alcohol or drugs.
- Never spray ignitable liquids or any other liquid on this product.
- Always keep hair and dangling or loose items well away from the insertion tools when the power supply is connected.

NOTICE: Modification with non-STEPCRAFT-approved components may result in refusal of service by STEPCRAFT.

⚠WARNING	This is a desktop 3D system that can hold tools with sharp blades spinning at very high RPM or tools getting really hot. Always use extreme caution and common sense when maintaining and operating this product. If you are unsure about ANY function or procedure described in this manual, DO NOT operate. Contact STEPCRAFT product support for assistance.

⚠WARNING	Always ensure you are operating the tool at a safe distance, 3 feet (1 meter), away from yourself and others.

TABLE OF CONTENTS

1 GENERAL NOTES 6

2 Work preparation (desktop 3D system) 6

2.1 Installing the software 6
2.2 Installing the machine parameters 6
2.3 Connecting the machine to the computer 7
2.4 Checking operational readiness 8
2.5 Manual test 9
2.6 Verification of the linear axes 10
2.7 Homing 10

3 Work preparation (work-piece) 10

3.1 Clamping of the work-piece material 11
3.2 Importing the pattern 11
3.3 Definition of work-piece zero point (X, Y) 12
3.4 Test drive without the use of tools 13
3.5 Preparation of the milling spindle 14
3.6 Definition of work-piece zero point (Z) 14

4 Starting the first milling process 17

1 GENERAL NOTES

This manual is intended to familiarize you with your desktop CNC / 3D system and to provide you with all the information you need in order to produce your first milling work-piece.

These instructions equally apply to the desktop CNC / 3D systems STEPCRAFT-2/210, /300, /420, /600 and /840, referred to in the following as STEPCRAFT.

⚠ CAUTION	**In order to operate the machine safely and professionally please read through this entire manual and all additional documentation provided prior to your first usage of your machine:** 1. **Operating instructions of your STEPCRAFT system** 2. **Operating instructions of your STEPCRAFT HF-spindle or the documentation provided of your third-party rotary tool** 3. **User manual of the CNC control software** To minimize the risk of injury and / or to prevent property damage, only operate the machine and the associated control unit when you are sure you have understood all of these instructions in their entirety.

Should questions arise, please contact us. Our contact details can be found on the front page of this manual.

2 WORK PREPARATION (DESKTOP 3D SYSTEM)

The following installation and testing instructions only apply to machines with a parallel interface and the control software UCCNC. For buyers of the machine with an USB port together with the control software WinPC-NC, ask for the appropriate documentation.

2.1 INSTALLING THE SOFTWARE

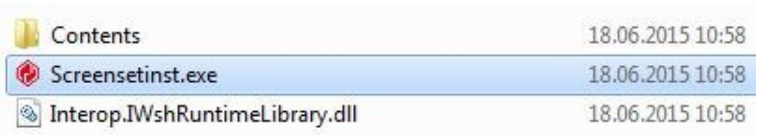
NOTICE: UCCNC comes with a STEPCRAFT desktop 3D system. This should only be connected to the computer when the software is completely installed and necessary drivers have been copied.

The installation of UCCNC is an easy to use set up program. Please insert the CD into the drive and wait for the automatic installation to start. If it does not start within a few seconds, run the SETUP.EXE program from the CD.

NOTICE: The complete UCCNC software installation process is documented in the user manual of UCCNC. Please refer to document "UCCNC_usersmanual.pdf" in the *<u>/manual/</u>* folder of the UCCNC CD.

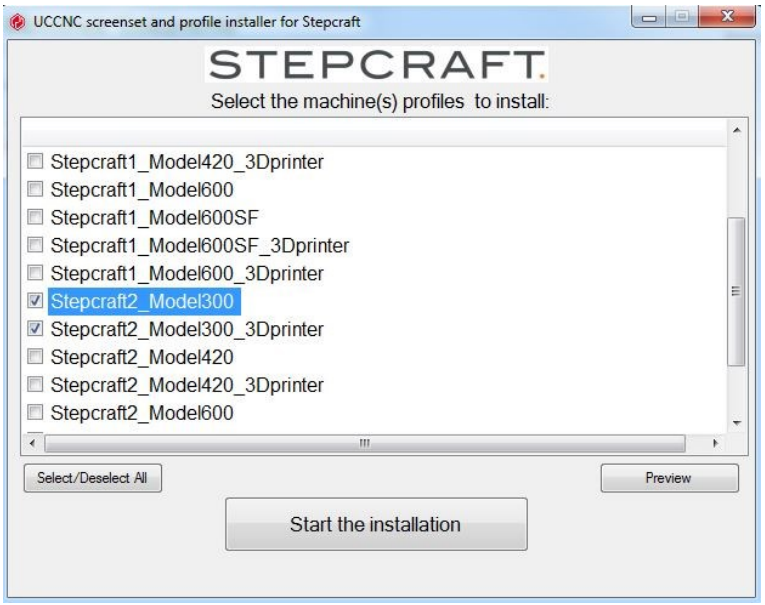
2.2 INSTALLING THE MACHINE PARAMETERS

After installation of the UCCNC software you need to install the appropriate STEPCRAFT machine parameters for UCCNC. Start "Screensetinst.exe" in the /Stepcraft/ folder:



Choose your type of machine size (210 to 840) and type of machine series (Stepcraft 1 **or** 2) and install both configurations:

- Regular installation for milling, carving, engraving, hot cutting
- 3D print configuration to operate the 3D print head

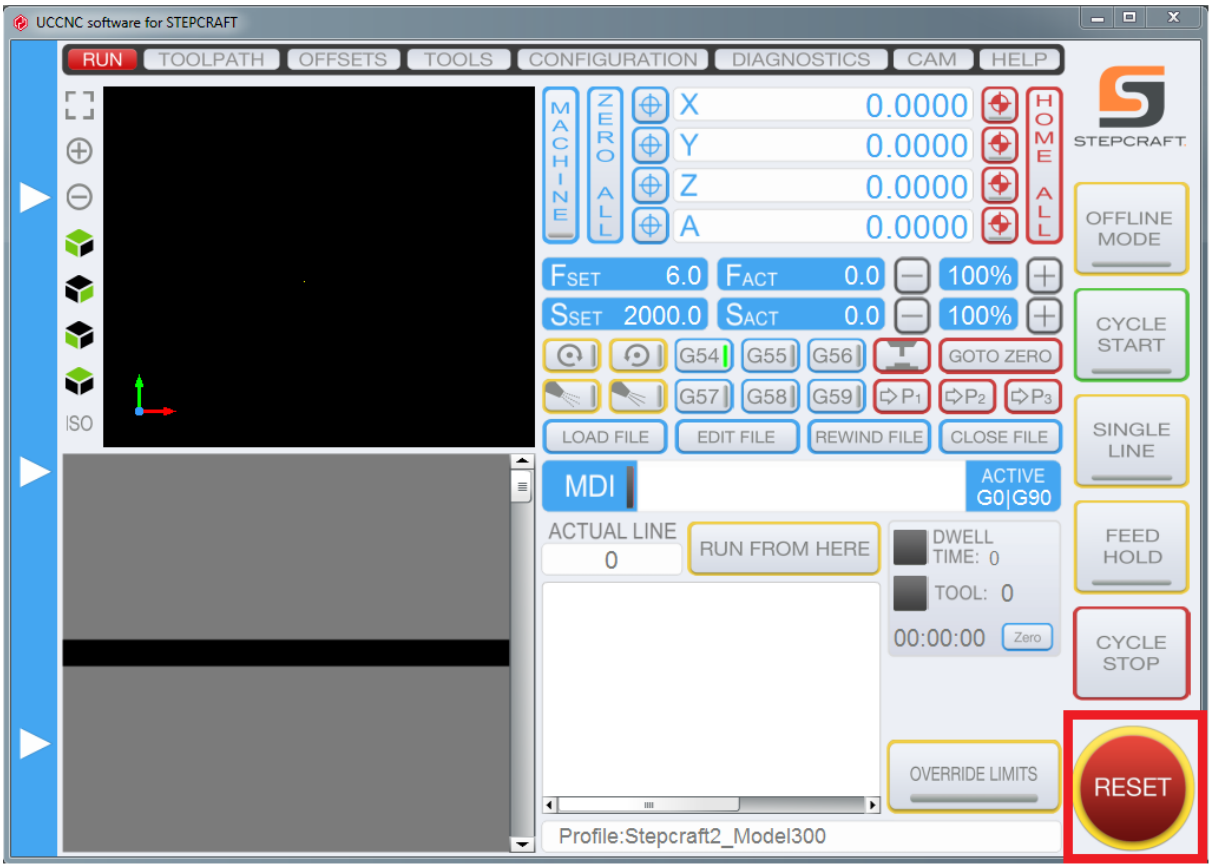


Start the installation. The installation will create two desktop icons and prepare, for example, different technical parameters for the linear guides, the 4th axis and the spindle control. In the 3D print configuration a plugin will be installed additionally to control the 3D print head.

NOTICE: You can start UCCNC with the STEPCRAFT parameters by clicking these icons. Always make sure that you choose the correct parameter setting / start icon for the machine operation planed.

2.3 CONNECTING THE MACHINE TO THE COMPUTER

After completing the software installation, connect the AC adapter to the power supply and the STEPCRAFT desktop 3D system. Connect the machine / the UC100 device with the enclosed USB cable to the computer and launch the program:



Every time you start the program, the reset-button in the bottom-right corner is flashing.

NOTICE: Release the emergency switch from the machine and make sure that no reference switch of the machine is being pressed.

Press the reset-button. The machine is ready for operation now.

2.4 CHECKING OPERATIONAL READINESS

After completing the software installation, the machine is ready. You can check the status of the machine via the LEDs on the control board at the rear of the machine:

(left-to-right direction. UC100 device LED 1 and LED 2, control board LED 1 and LED 2)

Status	**Control board LED 1** (green)	**Control board LED 2** (green)
1	Status = on Sharing ok, output stage switched on, emergency switch switched off	Status = on Voltage is applied at (5V)
2	Status = off Release not OK, off stage, emergency switch switched on	Status = on Voltage is applied at (5V)
3	Status = off	Status = off

Status	**Control board LED 1** (green)	**Control board LED 2** (green)
	Release not OK, end stage switched off, power is not active	Power disabled

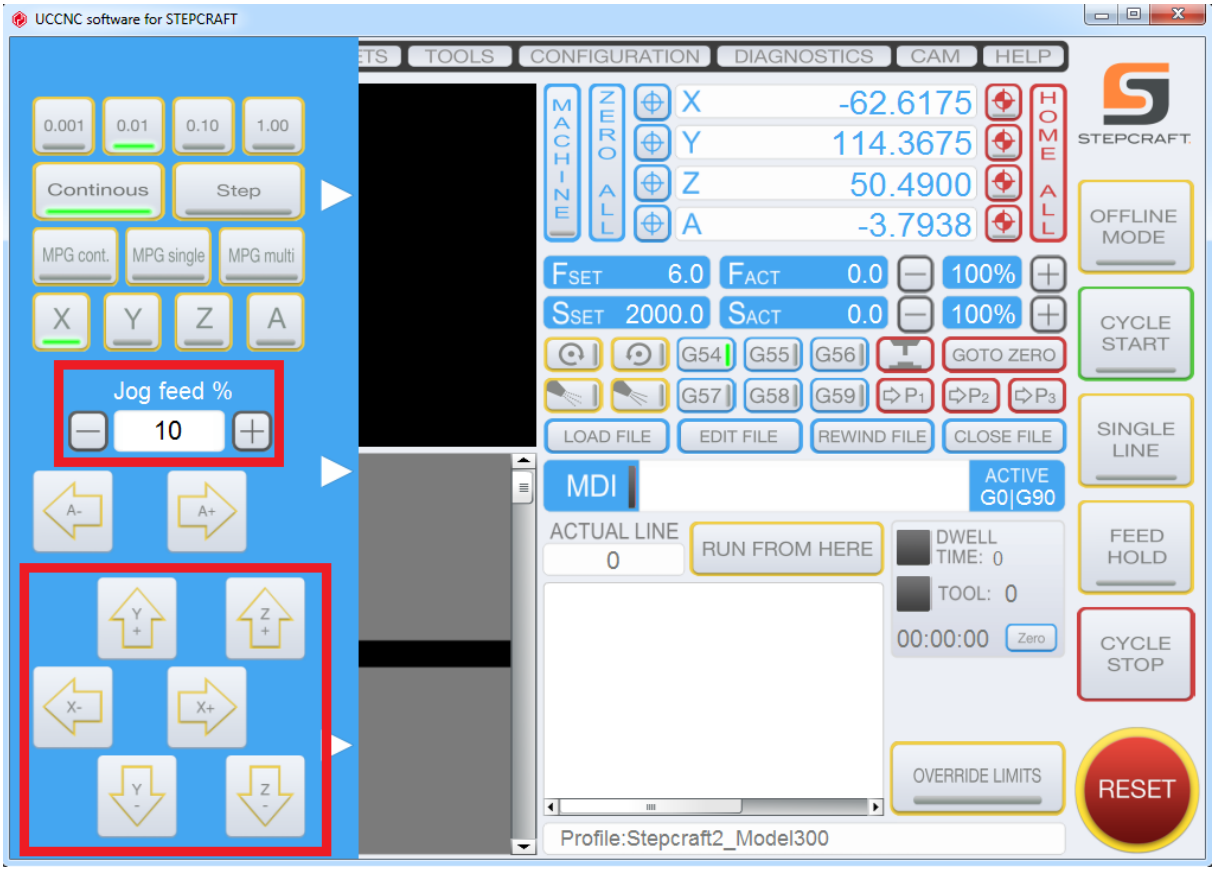
Status	**UC100 LED 1** (green)	**UC100 LED 2** (blue)
1	Status = on Existing USB-connection	Status = on UCCNC program is online / started
2	Status = on Existing USB-connection	Status = off UCCNC program is offline / not started
3	Status = off No existing USB-connection	Status = off UCCNC program is offline / not started

2.5 MANUAL TEST

If the STEPCRAFT is in status 1/1, it can now be moved manually.

NOTICE: Furthermore, the proper assembly of the machine, according to assembly instruction, is an essential requirement. Additionally, you need to ensure that the lead screws and the linear axes are greased according to the maintenance plan of the STEPCRAFT.

Now open the manual jog menu by moving the mouse pointer to the left side of the main screen:



Move the cursor to the arrow keys and place the machine carefully in the middle of the workspace of the system. To increase the moving speed you can adjust the jog feed.

Jog feed 10% = 300 mm/s

Jog feed 100% = 3,000 mm/s

2.6 VERIFICATION OF THE LINEAR AXES

NOTICE: The machine must be noiseless and needs to move without friction and tension in all linear axes.

NOTICE: If you have already levelled the machine you can skip this item and proceed with item 2.7.

For checking, please proceed as follows:

- Place the machine on a level surface
- First loosen the screws of the gantry parts of the X-axis (see instructions 5.2 and 5.4), the rear (see instruction 6.5) and the front (see instruction 8.10) of the Y-axis
- Move the Z-axis manually to an average height
- Move the X-axis manually to each end of the gantry and tighten the screws of each gantry part
- Now move the Y-axis towards the back and tighten the screws of the rear panel firmly
- Lastly proceed now towards the front and tighten the screws of the front panel

NOTICE: If you do not reach the final position of an axis in this way, then you must check the smooth running of linear axes and spindles. To do this, close the WinPC-NC / UCCNC or any other CNC control program and unplug the machine from the electricity supply. The X- and Z- axis can then be moved by hand over the axis connector (part 58). For movement of the Y-axis remove the tooth belt cover (part 75), and possibly also the tooth belt (part 73), in order to check the axes individually.

2.7 HOMING

Before you can start to work, the machine has to be homed (pick-up the reference point or machine zero-point). Press the “home all” button in the main screen:

The machine will start driving all axes now, beginning with the Z-axis, until it reaches the reference switch of each axis. When the homing is completed, the machine (seen from the front) features (X) on the left, (Y) at the rear and (Z) at the top.

At the same time, the reference for the machine zero point is initialized (above example for STEPCRAFT-2/300). The X-axis and the Z-axis will be initialized with 0, the Y-axis with the possible traverse distance.

Notice: The actual machine zero point is (front view) left (X), front (Y), top (Z). Notice that the reference switch for the Y-axis is at the rear but the machine zero point for the Y-axis is at the front. This explains why all axes except the Y-axis will be set to zero after initialization.

The reference run is to be carried out regularly after turning on the machine and before starting to work.

3 WORK PREPARATION (WORK-PIECE)

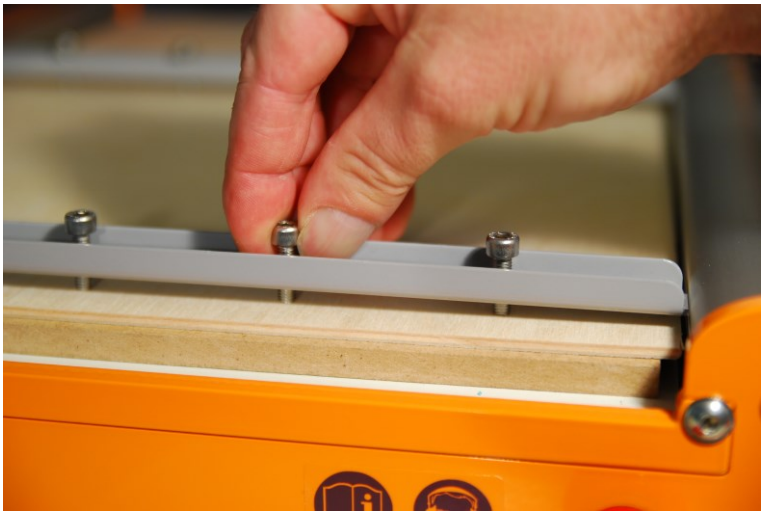
For further implementing the first step instruction, you are in need of the following materials:

- Spindle, e.g. Proxxon IBS/E, with clamping adapter or alternative spindle like a STEPCRAFT HF-SPINDLE
- Cutters for woodworking (spiral cut) with 2 mm diameter or similar tool
- Offer worktop, e.g. out of MDF

- Work-piece material, such as plywood, with a thickness of 3 mm (1/8 inch) and a size of approx. 200 mm x 200 mm (6 inch x 6 inch)

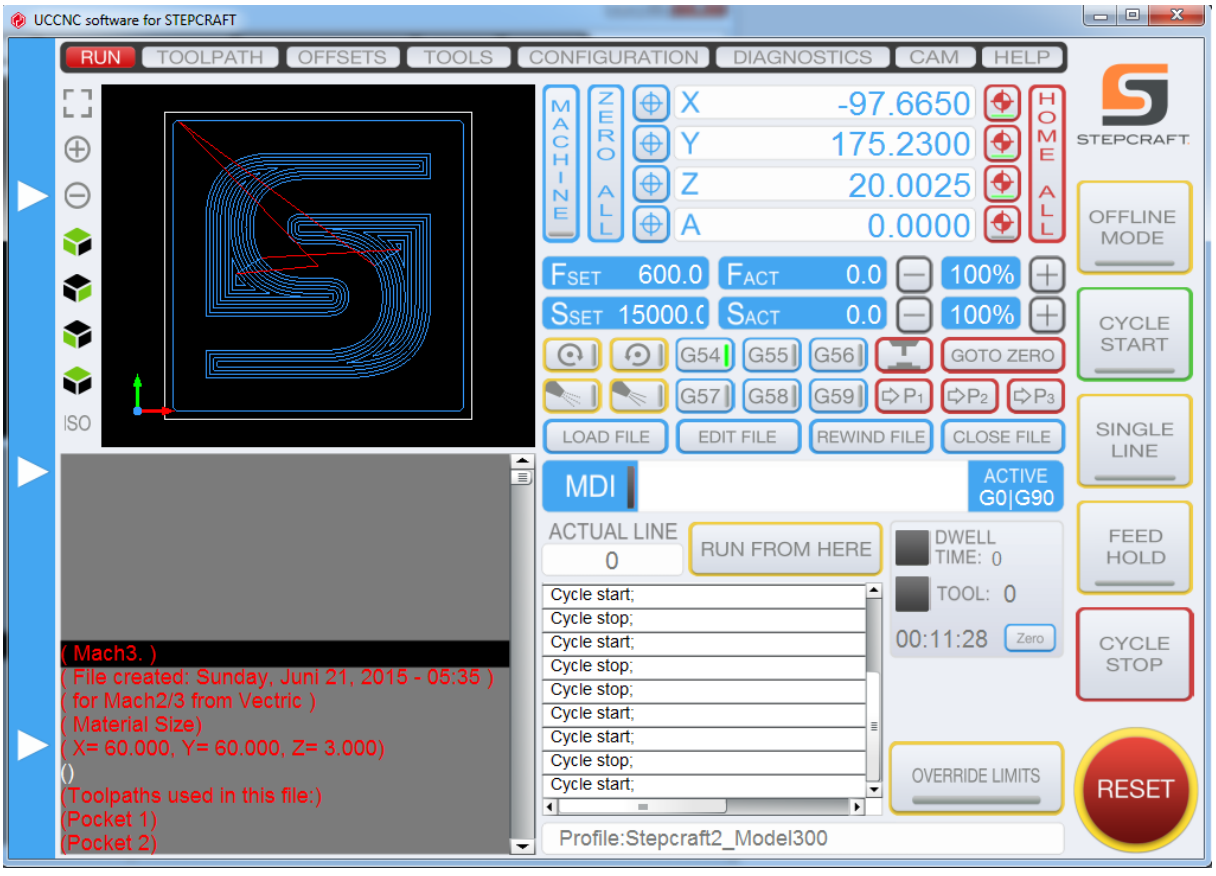
3.1 CLAMPING OF THE WORK-PIECE MATERIAL

First you place the offer worktop on the machine table, secondly the work-piece material. Attach the two plates with the accompanying retainers from the STEPCRAFT to the machine table. The screws need to be tightened by hand only:



3.2 IMPORTING THE PATTERN

Open the pattern file with the “Load File” button in the main screen. Navigate to the */Examples/02-Milling* directory of the UCCNC CD and open the file *Stepcraft-logo.nc*.



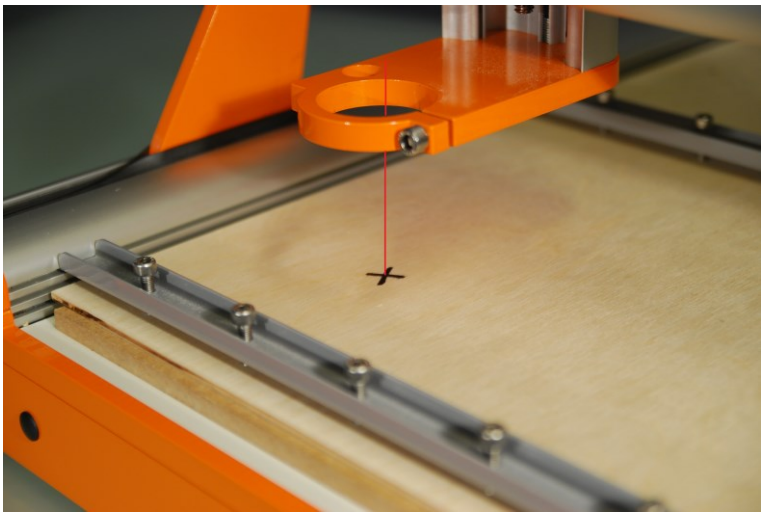
The file consists of an engraved pattern of the Stepcraft logo and the cut out of the work-piece. The work-piece has a size of 60 x 60 mm (approx. 2.5 inch x 2.5 inch) and requires a material with a thickness of 3 mm (approx. 1/8 inch).

NOTICE: The starting point for this pattern was originally set in the CAM program to the middle of the work-piece. It is also common to set the starting point to the edge of the work-piece, for example to the left front corner. Every time you import an already existing work file you have to make sure where the starting point of the CNC code is.

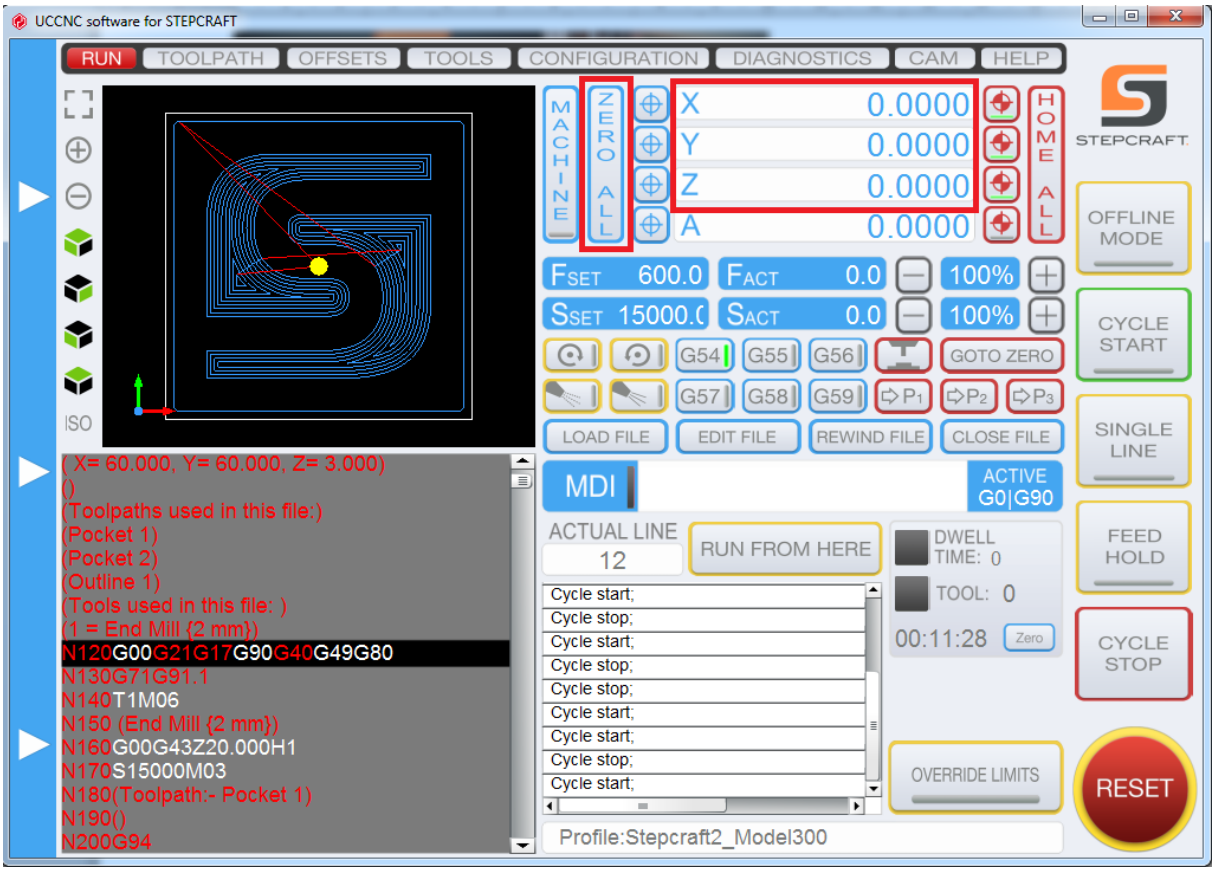
3.3 Definition of work-piece zero point (X, Y)

Beside the knowledge of the starting point of the CNC code you need to define the starting point on the work sheet. This point is also called work-piece zero point. Highlight this point with an "X". Make sure that, when seen from the front, there is sufficient travel available to the left and right and to the front and rear side (at least 40 - 50 mm in each direction).

Open the "jog" menu by moving your mouse pointer about the left screen side of the program and then drive the machine manually to the point marked. Move the Z-axis to half maximum height.



Save these settings by clicking "Zero all" in the main screen.



The work-piece coordinates are then X = 0.000, Y = 0.000 and Z = 0.000. The yellow dot in the toolpath preview marks the actual position of the machine and is located in the centre of the work-piece as expected.

NOTICE: If you do not see the yellow dot in the centre of the work-piece toolpath, repeat item 2.7 and 3.3.

3.4 TEST DRIVE WITHOUT THE USE OF TOOLS

⚠WARNING **Unplug rotary tool from the mains before starting the simulation. Make sure that the spindle is switched off and not connected to the main board (if applicable).**

For a test drive you have two possibilities:

- Simulate the drive in the offline mode of the software. Simply press “Offline mode” in the main screen (red bar of the button starts to flash). After that, start the simulation by pressing “Cycle start”. The yellow dot starts to move and marks the position of the tool. Green lines are already passed through tool paths. You can interrupt the simulation by pressing “Feed hold”. Press this button again and the simulation continues. You stop the simulation with pressing “Cycle stop”. If you stop the simulation before the last row of the working file has been processed, you need to rewind the file in order to make sure that the next cycle starts at the first row of the file. Do not forget to switch off the offline mode.
- Simulate the drive in the online mode of the software without using a cutting tool. Press “Cycle start”. The machine starts to move. Additionally, the yellow dot in the screen starts to move as well and marks the position of the tool. Green lines are already passed through tool paths. You can interrupt the simulation by pressing “Feed hold”. Press this button again and the “real” simulation continues. You stop the simulation by pressing “Cycle stop”. If you stop the simulation before the last row of the working file has been processed, you need to rewind the file in order to make sure that the next cycle starts at the first row of the file.

NOTICE: After the simulation has been finished, press the button “Go to zero” in the main screen. The machine moves immediately to the work-piece zero point.

3.5 PREPARATION OF THE MILLING SPINDLE

WARNING

Disconnect the plug from the power source before making any assembly, adjustment or change of accessories. Such preventive safety measures reduce the risk of starting the tool accidentally.

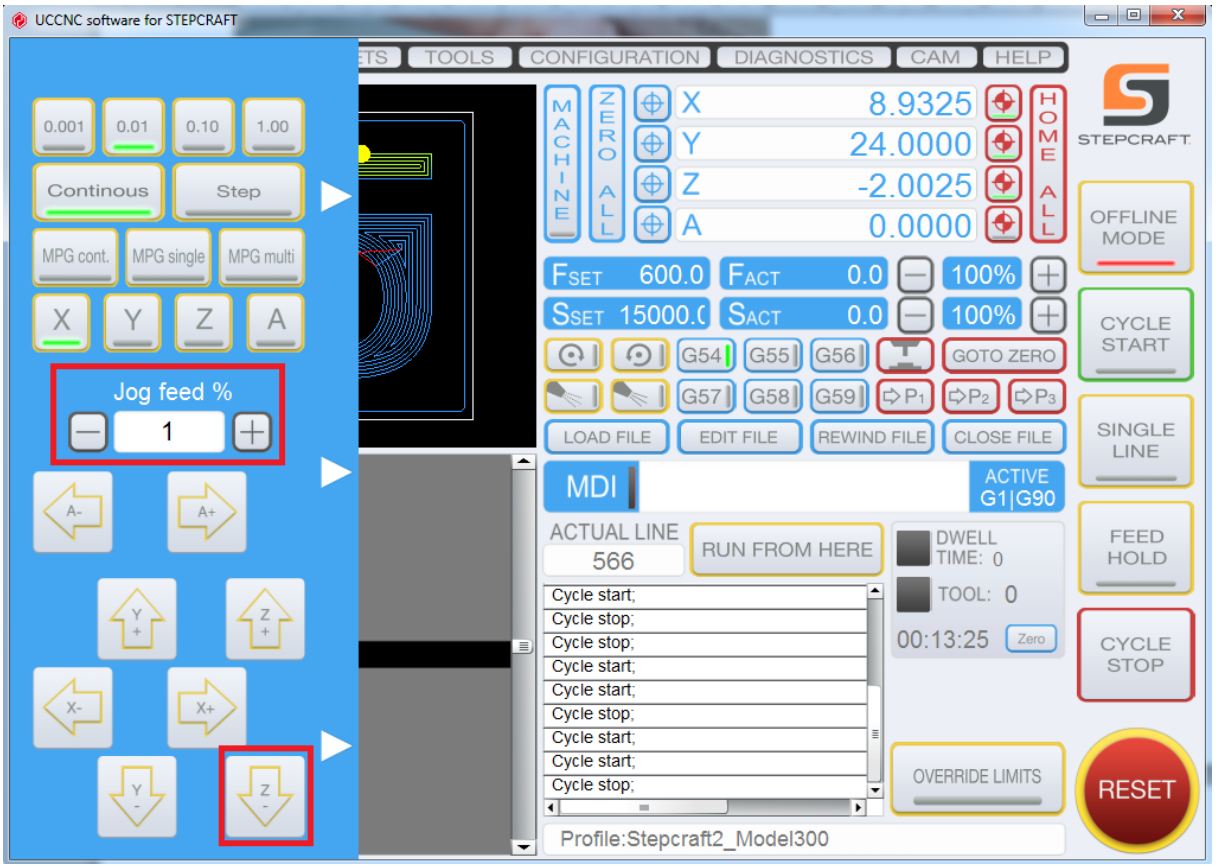
Chuck the milling tool into the spindle. Make sure that you select the correct collet in order for the cutter to be held tightly.

The cutter should always be inserted into the collet as far as possible.

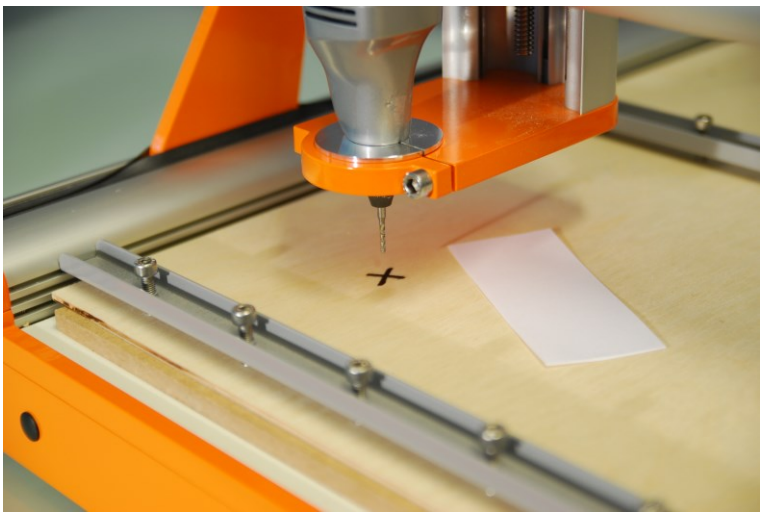
After the insertion tool has been fixed in the collet, the spindle has to be clamped into the machine. The machine has a 43 mm tensioning system. You need a tool adapter if the tool neck is smaller than 43 mm. Lock the spindle, or the spindle with tool adapter, into the tensioning system with an Allen key.

3.6 DEFINITION OF WORK-PIECE ZERO POINT (Z)

The work-piece zero point (Z) is the point where the end mill touches the surface of the work-piece. Jog carefully with the cutting tool towards the work-piece. If the cutter is close to the surface, reduce the jog feed to 1.

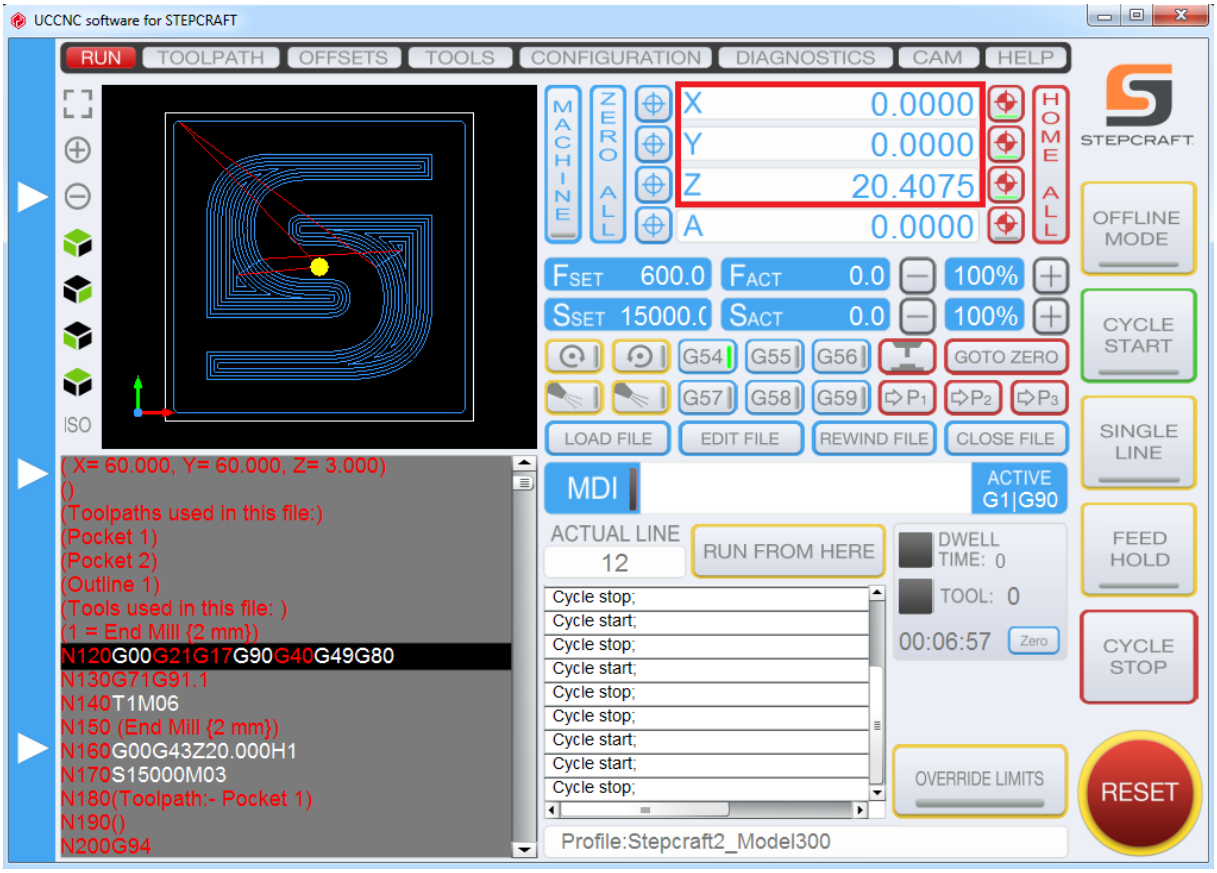


NOTICE: Take a piece of paper, place it onto the work sheet and proceed slowly and manually in the Z-axis downwards towards the work-piece.



Move the paper back and forth with your fingers. Once the cutter touches the paper, save that point again as the work-piece zero point X / Y / Z by pressing “Zero all”:

After this move the Z-axis manually up to approx. 20 mm above the work-piece.



4 STARTING THE FIRST MILLING PROCESS

⚠ CAUTION	**Stay alert, watch what you are doing and use common sense when operating a power tool. Do not use a power tool while you are tired and/or under the influence of drugs, alcohol or medication.** A moment of inattention while operating power tools may result in serious personal injury.
⚠ CAUTION	**Use personal protective equipment. Always wear eye protection**. Protective equipment will reduce personal injuries.
⚠ CAUTION	**Prior to first usage, read the manual of your rotary tool / STEPCRAFT HF-spindle thoroughly and carefully, making sure you have understood everything.**

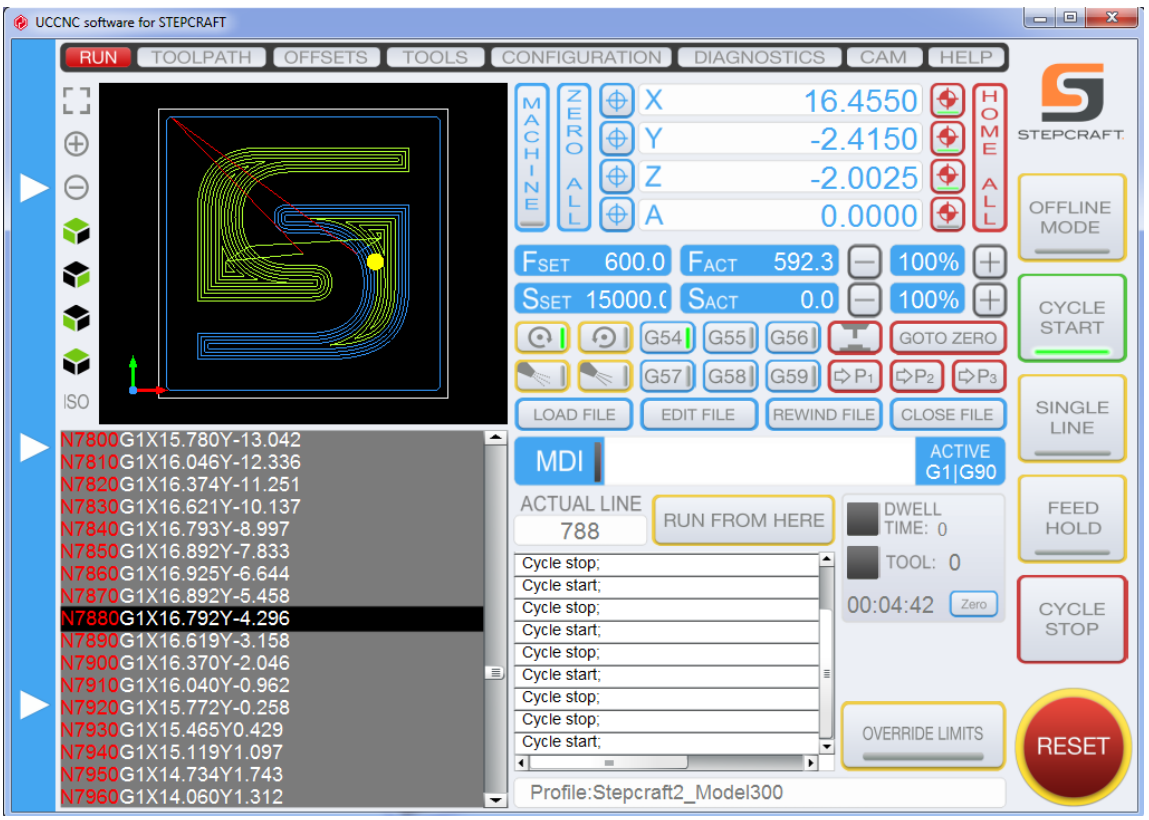
In preparation for the first drive, please proceed as follows:

- Check the seating of the work-piece plate
- If you use a manual controlled spindle with no connection to the main board / the control software UCCNC, be aware that you have to control the spindle personally. Turn the spindle on and preselect the speed of the spindle to 15,000 rev / min.
- If you use the STEPCRAFT HF-spindle, the spindle must be connected to the spindle controller. Additionally, the spindle controller has to be connected to the mainboard of the machine by using the Pin-15 D-sub cable. Switch on the control unit of the spindle; it connects to the spindle engine. Upon a successful connection, an audible confirmation can be heard (5 tones). The spindle is now ready for operation. The speed of the HF-spindle will be automatically controlled by UCCNC.

Now press the “cycle start” button.

⚠ CAUTION	**The spindle should start immediately after pressing the “Cycle start” button if you use an automatically controlled spindle like the STEPCRAFT HF-spindle. If the spindle does not start, press the emergency button immediately and check the installation of the spindle.**

The machine moves to the work-piece zero point X = 0.000 and Y = 0.000, afterwards in all axes for the first step (pocket 1) down to Z = -2.000. The manufacturing starts.



After completing the work process, the system automatically moves to the work-piece zero point (X, Y) and 20 mm above the surface of the work-piece (Z). Turn off the spindle (if manually controlled) and remove the work-piece.

Congratulations! You have completed your first work-piece with your STEPCRAFT.

NOTES

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